September 11, 2002

Information Technology

The Defense Advanced Research Projects Agency's Transition of Advanced Information Technology Programs
(D-2002-146)

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Office of the Inspector General

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Acronyms

ACTD	Advanced Concept Technology Demonstration
ATD	Advanced Technology Demonstration
DARPA	Defense Advanced Research Projects Agency
IT	Information Technology
S&T	Science and Technology

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September 11, 2002

MEMORANDUM FOR DIRECTOR, DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

SUBJECT: Audit Report on the Defense Advanced Research Projects Agency's Transition of Advanced Information Technology Programs (Report No. D-2002-146)

We are providing this report for your information and use. We considered comments from the Director, Defense Advanced Research Projects Agency in preparing this report.

We appreciate the courtesies extended to the audit staff. For additional information on this report, please contact Mr. Bruce A. Burton at (703) 604-9071 (DSN 664-9071) (bburton@dodig.osd.mil) or Mr. Michael E. Simpson at (703) 604-8972 (DSN 664-8972) (msimpson@dodig.osd.mil). See Appendix C for the report distribution. The audit team members are listed inside the back cover.

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Report No. D-2002-146 **September 11, 2002**
(Project No. D2001AB-0141)

The Defense Advanced Research Projects Agency's Transition of Advanced Information Technology Programs

Executive Summary

Who Should Read This Report and Why? The DoD acquisition community and military and commercial program managers who develop and transition information technology should read this report on how the Defense Advanced Research Projects Agency has transitioned information technology programs.

Background. Congress and DoD officials have voiced concern that technology has not quickly transitioned to the warfighter. The Defense Advanced Research Projects Agency's mission is to develop imaginative, innovative, and often high-risk research ideas offering a significant technological impact on DoD and commercial systems. The primary role of the Defense Advanced Research Projects Agency is to act as the technical change leader for the DoD and its mission is to promote revolutionary technical innovations to support our national security.

Results. The Defense Advanced Research Projects Agency has transitioned advanced information technology programs to the military and civilian communities. A review of 17 information technology programs funded at a total of $280 million from FYs 1999 through 2001 showed that all or parts of 13 programs funded at a total of $240 million over the same period were transitioned to military and commercial users, two programs were still ongoing, and two programs were terminated. Transition of programs that advanced warfighting capabilities occurred because the program managers were effectively planning, managing, and coordinating with potential users.

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Background

DoD Acquisition Policy. DoD Directive 5000.1, "The Defense Acquisition System," (Incorporating Change 1, January 4, 2001) October 23, 2000, states that science and technology (S&T) projects shall address user needs. Programs will be broad based, spanning all DoD S&T, to anticipate future needs and those technologies not being pursued by civil or commercial communities. The S&T projects will preserve long-range research and should enable rapid transition from the S&T base to useful military products. Specific S&T products must focus on increasing the effectiveness of a capability, decreasing costs, increasing operational life, and improving the capabilities of systems through planned upgrades.

Science and Technology Guidance. An affordability task force chartered by the Director for Defense Research and Engineering issued a handbook in October 1999, and the Deputy Under Secretary of Defense (Science and Technology) issued a guide in April 2001 to the Military Departments and Defense agencies concerning practices that they believed, if instituted, would assist in transitioning technology. In addition, in response to congressional concerns that the DoD had not been successful in transitioning technology, the Under Secretary of Defense for Acquisition, Technology, and Logistics issued a report to Congress identifying why technology was not transitioning.

Report of the Under Secretary of Defense for Acquisition, Technology, and Logistics to Congress. In June 2001, the Under Secretary of Defense for Acquisition, Technology, and Logistics provided a report on technology transitions to the congressional Defense committees from the Defense Advanced Research Projects Agency (DARPA). The report provided Congress with the results of a review of the transition of research to the acquisition program managers and, ultimately, to the warfighter. The report cited the need for collaboration among three diverse groups, the S&T researcher, the acquisition program manager, and the military user, as a key reason for difficult technology transition. Effective transition requires the groups to work together as a team, which is frequently a difficult issue. In addition, for a technology transition to be successful, the acquisition program manager's prime contractor must be supportive of the technology insertion, and the technology must demonstrate a greater return than the existing capability.

Objectives

Our objective was to determine whether DARPA transitioned its information technology advanced technology programs into military applications. See Appendix A for a discussion of the audit scope and methodology and the review of the management control program.

Transition of Defense Advanced Research Projects Agency's Information Technology Programs

The DARPA has transitioned advanced information technology (IT) programs to military and commercial users. Our review of 17 IT programs showed that all or parts of 13 programs that received funds totaling $240 million from FYs 1999 through 2001were transitioned to military and commercial users, two programs were still ongoing, and two programs were terminated. The 17 programs received $280 million in total funding over the same period. Those transitions occurred because the DARPA program managers had effectively managed the IT programs with the goal of transitioning all or parts of the program to military and civilian users. As a result of DARPA IT transitions, the military and civilian communities are able to improve and advance the warfighter's capabilities.

Information Technology Program Process

DARPA Program Process. The primary mission of DARPA is to act as the technical change leader for the DoD and to promote revolutionary technical innovations to support national security. DARPA focuses on high-risk research and complements, but is not a substitute for, the Services' science and technology and acquisition organizations. Unlike the Services, DARPA does not manage formal acquisition programs. The DARPA Director rarely approves funding for applications or extensions of existing technology.

A program starts as an idea or concept generated by a DARPA program manager that is briefed to the Director of DARPA who decides whether the program warrants funding. DARPA management evaluates program goals, objectives, structure, and content and then determines whether a program's concept represents a revolutionary or evolutionary change. Once the decision is made to fund the program, the program manager then funds personnel to develop the technology and perform the work. Those personnel are called principal investigators. Other personnel called agents complete the necessary paperwork associated with any government contracts, funding documents, and reports.

Program Manager Responsibilities. Program managers are responsible for all acquisition planning and program oversight, including budgeting, staffing, and directing the day-to-day management of the program to achieve the goals of the IT program. Some of the questions that the DARPA management continually asks the program managers during formal and informal briefings are:

- What are you trying to accomplish?
- If successful, what difference will it make to national security?
- What are the mid-term tests, final exams, and what will be the DARPA "exit strategy"?

Program Transitions

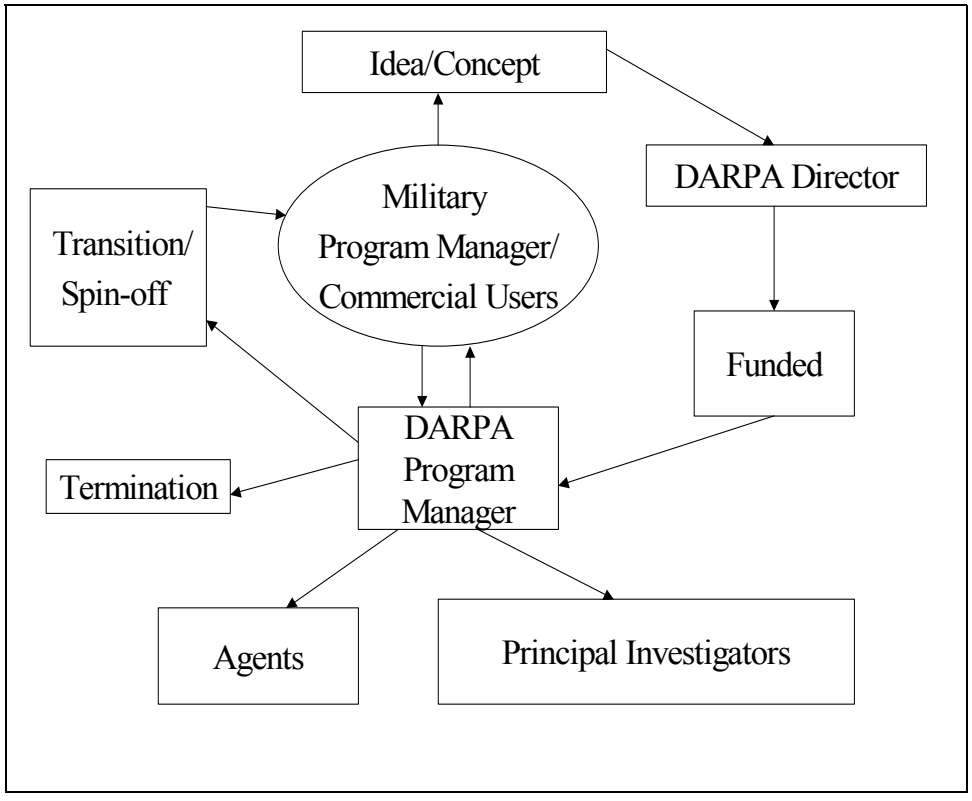
The audit examined 17 IT programs that received $280 million for research, development, test, and evaluation from FY 1999 through FY 2001. The 17 programs that we reviewed used advanced technology development funding that was categorized as 6.3 funding. Thirteen of the IT programs were transitioned to a new military user, an ongoing program, and the commercial sector. Nine of the 13 programs were transitioned to various military commands for immediate use and for use in ongoing military projects. For example, the technology from the Control of Agent Based Systems program was transitioned to the Air Mobility Command. The technology involved software agents that were able to detect complex events across several Air Mobility Command data sources and systems. The benefits gained by the Air Mobility Command from using the transitioned technology included the decrease in manual searches for data, operational alerts to personnel, and improved reaction times for key events and decisions. Also, as discussed in the example below, technology went to both the military and commercial sectors. The Organically Assured and Survivable Information Systems program was to provide defense mechanisms against adversaries to allow operation of mission-critical functions in the face of cyber attacks against information systems. This capability was transitioned to a commercial company and the Air Force Research Laboratory. Two programs are still ongoing and are expected to transition in FY 2003 according to the program managers. Two programs were terminated because of funding cuts; however, parts of one terminated program were put into another ongoing program. The following table depicts the programs that transitioned and their transition dates. (See Appendix B for a complete list of the IT programs and their status.)

Program Transitions

Program	Fiscal Years
1. Synthetic Theater of War ACTD	2000
2. Battlefield Awareness and Data Dissemination	1999 – 2000
3. Joint Force Air Component Commander	2002
4. Command Post of The Future	2002
5. Active Templates	2002 – 2003
6. Advanced Simulation Technology Thrust	1999
7. Information Assurance Integrated Testbed	2001
8. Joint Task Force ATD	1999
9. Control of Agent Based Systems	2001
10. Advanced Networking Technology	1999
11. Broadband IT	1999
12. Genoa	2000
13. Organically Assured and Survivable IT	2002 – 2003

Effective Management of Information Technology Transition

The primary mission of DARPA requires it to focus its investments on revolutionary breakthroughs, rather than on short-term technology demonstrations. The technology process hinges on either reducing the risk of new technology so that it becomes more useful for the customer than an existing capability, or providing a leap-ahead capability that is worth the necessary investment. Technology transition is difficult because it requires the collaboration of three diverse groups of individuals: researchers, acquisition program managers, and military users. There must be a partnership between researchers, acquisition program managers, and military users to provide timely information on the development and implementation of the new technology. There is no single pathway or technology transition process appropriate for all technologies. The figure below depicts the DARPA transition process as described by the DARPA Comtroller.



DARPA Transition Process

As stated in the DARPA report provided to Congress by the Under Secretary of Defense for Acquisition, Technology, and Logistics in June 2001, DARPA uses a broad range of transition strategies to match the array of technologies that it promotes. As an entrepreneurial technical organization, DARPA operates outside the requirements and acquisition system, but constantly seeks opportunities to give new capabilities back to the Services and other Defense agencies. DARPA, in its report, notes three techniques that it believes are the basis for success in implementing its technology transition process.

Building on What Works. DARPA believes that continuous communication among researchers, acquisition program managers, and military users is an effective way to improve the transition of technology. DARPA and a Service frequently team to commit funding to develop a technology for the Service. DARPA is working with the Army, Navy, and Air Force to develop various programs. For example, DARPA joined with the Navy and Air Force to develop an Unmanned Combat Air Vehicle.

Improving Understanding. DARPA examines its transition process and evaluates how its technologies have transitioned in the recent past. The goal is to improve its ability to transition through a lessons-learned approach on transition strategies that have worked best for technologies under varying circumstances.

Strengthening and Adding Strategies. DARPA is improving its strategic approach and developing new approaches to use DoD initiatives for improving technology transition to the warfighter. DARPA also plans to build a closer working relationship with the Navy's newly installed Chief Technology Officer.

Conclusion

The DARPA is successfully pursuing new information technology programs and, when it is feasible, the technology derived is being transitioned to military and commercial users. In addition, to further improve technology transition, future S&T program planning at DARPA and the Services must continue to focus on the needs of the warfighter.

Management Comments

The Director attributed DARPA's transition success to emphasis on planning for transition in all program phases starting with its initial presentation of a program for approval. The DARPA approach resulted in a very respectable rate of transition success, given the high-risk nature of the programs.

Appendix A. Scope and Methodology

We examined DARPA Information Systems ATD programs funded with 6.3 Research and Development appropriations. DARPA headquarters listed 18 Information Systems programs that were categorized as 6.3 advanced technology programs. However, one of the programs was classified so we excluded that program from our review and reviewed the remaining 17 IT programs. Those programs received $280 million from FY 1999 through FY 2001. We met with each DARPA Program Manager to obtain information on the IT program. We also interviewed many program investigators and agents to obtain additional documentation. Finally, we went to at least one end-user for each of the seven transitioned programs to verify that they were using the technology that DARPA stated had transitioned.

We performed this audit from July 2001 through May 2002 in accordance with generally accepted government auditing standards. We did not review one classified IT program. We did not evaluate the merits of the IT programs or the funding levels provided to us by DARPA. In addition, we limited our review to determining that the IT program was transitioned to an end user. Also, we did not review the management control program for DARPA. We limited our review of controls to the reliability of the FY 2001 DoD Annual Statements of Assurance.

Use of Computer-Processed Data. We did not use computer-processed data to perform this audit.

Use of Technical Assistance. We did not rely on technical assistance to perform this audit.

General Accounting Office High-Risk Area. The General Accounting Office has identified several high-risk areas in the DoD. This report provides coverage of the Weapon System Acquisition high-risk area.

Management Control Program Review

We did not review the management control program for DARPA. We limited our review of controls to the reliability of the FY 2001 DoD Annual Statements of Assurance. The Statement of Assurance provides that DARPA has reasonable assurance that management controls are in place and operating effectively. Based on our review of the 17 DARPA programs, we found reasonable assurance that management controls were in place for transitioning the IT programs.

Prior Coverage

During the last 5 years, the General Accounting Office has issued two audits discussing technology transitioning to the warfighters.

GAO

Report No. GAO-1-311, Defense Acquisition: Army Transformation Faces Weapon Systems Challenges, May 21, 2001

Report No. NSIAD-99-162, Best Practices: Better Management of Technology Development Can Improve System Outcomes, July 30, 1999

Program	Total Funding FYs 1999-2001	Transition/ Termination Date	Status
1. Synthetic Theater of War Advanced Concept Technology Demonstration	$12,686,180	FY 2000	Transitioned to warfighter through U.S. Joint Forces Command, J95
2. Battlefield Awareness and Data Dissemination	$14,364,794	FY 1999 - 2000 FY 1999 - 2000	Battlefield awareness portion transitioned to Global Command and Control System - Intelligent, Integration of Information Program. Data dissemination capabilities transitioned to Information Dissemination Program at Defense Information Systems Agency
3. Joint Force Air Component Commander	$34,892,693	FY 2002	Algorithms transitioned to Air Force for use in the Unmanned Combat Air Vehicle. Some technology transitioned into Mixed Initiative Control of Autonomous Program
4. Command Post of the Future	$36,002,638	FY 2002	Parts of the Command Post of the Future Program were transitioned into the Joint Theater Logistics Advanced Concept Technology Demonstration
5. Active Templates	$19,943,485	FY 2002 FY 2003	Transitioned to Army Special Operations Battle Laboratory Transitioned to the Special Operations Forces Tools planning device in the U.S. Special Operations Command for inventory and maintenance. (Expected Transition November 2002)
6. Advanced Simulation Technology Thrust	$11,811,659	FY 2000	Joint Simulation Systems Environment Tailoring services project transitioned to Defense Modeling and Simulation Office for further development. Integrated Geo-typical Terrain Generation project transitioned to Simulation Training and Instrumentation Command for research. Model-Based Simulation composition transitioned to Joint Simulation Systems at Simulation, Training, and Instrumentation Command for further development.
7. Agile Information Control Environment	$22,773,914	FY 2000	Gary Koob took over for Bob Beaton after DARPA realigned its Information Systems Office. Koob terminated program in December of 1999 after 1 year. Principal Investigators say program lost momentum after Beaton left.
8. Information Assurance Integrated Testbed	$41,634,242	FY 2001	Navy submitted an addendum to the Program Objective Memorandum to fund the transitioning of the Autonomic Distributed Firewall Project.

Program	Total Funding FYs 1999-2001	Transition Termination Date	Status
9. Information Assurance Science and Engineering Tools	$13,686,573	FY 2001	DARPA realigned its Information Systems Office in 2001 and Information Assurance Science and Engineering Tools was terminated due to lack of program momentum, although four projects from the Information Assurance Science and Engineering Tools were taken up by the Organically Assured and Survivable Information Systems Program.
10. Joint Task Force Advanced Technology Demonstration	$5,578,165	FY 1999	Tools developed were transitioned into several entities. Most notable was Science Applications International Corporation where the product was patented and commercialized. Others included the Advanced Information Technology System Joint Program Office, Space and Naval Warfare Center. The tools are also being used on a project for the Office of Naval Research and Project Genoa.
11. Control of Agent Based Systems	$32,287,863		Airborne Manned/Unmanned System Technology transitioned to Aviation Applied Technology Directorate - Aviation and Missile Command.
		FY 2001	Transitioned to Navy Warfare Development Command - Space and Naval Warfare Systems Command who are evaluating grid for developing Expeditionary Sensor Grid.
		FY 2001	Naval Reconnaissance Office - Technical Exchange with BAE Systems - Developing indications and warning transitioned applications using the grid for Naval Research Director's initiative to Global Information Tek, Incorporated.
		FY 2002	Communications Electronics Command Logistics Command and Control Advanced Technology Demonstration/Agile Commander Advanced Technology Demonstration "Vigilant Advisor" transitioned the grid for application and use of mobile agents to Lockheed Martin - Advanced Technology Laboratory.
			Naval Warfare Development Command - transitioned to Coalition Agents Experiment process panels in the Fleet Battle Experiment - Japan coalition (University of Edinburgh - Artificial Intelligence Applications Institute).

Program	Total Funding FYs 1999-2001	Transition Termination Date	Status
12. Advanced Networking Technology (ANT)	$3,597,084	FY 1999	Technologies transitioned to Naval Research Laboratory , Office of Naval Research, the Navy/Marine Program, and the Extending the Littoral Battlespace.
13. Broadband Information Technology (BIT)	$5,526,918	FY 1999.	Broadband Information Technology transitioned to facilitate Next Generation Internet (PETAWEB) to DoD, Department of Energy, and National Security Agency.
14. Genoa	$6,060,780	FY 2000	Delivered Athens Thematic Navigator to Interlink. Transitioned Genoa enclaves to Defense Intelligence Agency, Secretary of Defense, Joint Chiefs of Staffs, Pacific Command.
15. Organically Assured and Survivable Information Systems	$15,758,828	FY 2002	Watermarking, Sandboxing, and Willow projects transitioning to Joint Battlespace Infosphere under Air Force Research Laboratory funding. Binary Agent Technology projects are transitioning to industry.
16. Biologically Based Pattern Recognition	$1,000,000	Not Applicable	The program is still ongoing
17. Scalable Knowledge-Oriented	$1,800,000	Not Applicable	The program is still ongoing
Total	**$279,405,816**		

Appendix C. Report Distribution

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Defense Advanced Research Project Agency Comments

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JUL 23 2002

MEMORANDUM FOR DEPUTY DIRECTOR, ACQUISITION MANAGEMENT
DIRECTORATE DEPARTMENT OF DEFENSE
INSPECTOR GENERAL

SUBJECT: Audit Report on the Defense Advanced Research Projects Agency's Transition of Advanced Information Technology Programs (Project No. D2001AB-0141)

The Defense Advanced Research Projects Agency (DARPA) has reviewed the subject draft audit report and concurs with the report as written.

Overall, DARPA finds that the report provides an accurate and positive portrayal of DARPA's success in transitioning advanced information technology programs. DARPA attributes its transition success to emphasis on planning for transition in all program phases starting with the initial presentation of a program for approval. As found in this report, DARPA's approach has resulted in a very respectable rate of transition success given the high-risk nature of DARPA's programs.

DARPA appreciates the opportunity to comment on this draft report. My staff point of contact on this matter is Mr. Mike Bryant. He may be reached by e-mail at mbryant@darpa.mil or by telephone at (703) 696-2415.

Anthony J. Tether
Director

cc:
USD(AT&L)

Audit Team Members

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